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Interactive comment on "GO_3D_OBS – The Nankai Trough-inspired benchmark geomodel for seismic imaging methods assessment and next generation 3D surveys design (version 1.0)" *by* Andrzej Górszczyk and Stéphane Operto

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The manuscript describes about novel model development efforts based on the authors' previous works in the eastern Nankai Trough. The paper is well written and mostly easy to follow. The developed model will be useful for the community including the model developing methodologies.

I have comments as below. I found two components are missing: i) comparisons of waveforms to observed ones : are the waveforms representative enough? , ii) compar-

isons with drilling efforts or onshore proxy sites for physical properties. Some discussions will be useful.

i) FWI intended

It is fine to build a model with a focus on multiparameter FWI – but slightly differs from title (imaging). You start FWI as "velocity building" which is typically different from "imaging". You may want to clarify these points and perhaps add "FWI" in abstract. Can the authors discuss if we can simulate 3D reflection dataset (as in Kumano) using the model and test various imaging methods too? Are the grid sizes etc sufficient?

ii) IODP drilling efforts and lab experiments, other subduction zones

There are numerous drilling efforts in the subduction zones and field sampling in proxy sites, including those off the Kumano-nada region of the Nankai trough. The physical properties (and so on) should reflect the results. Please add comments on how your model leverage these efforts.

Eastern Nankai?: Kingston's work is off Kumano and thus not eastern Nankai. As your structural model significantly depends on his work, I suggest to remove specific reference to "eastern" and add references of Kumano too.

The authors describe very lightly about applicability to other subduction zone studies. How much does the model applicable and what sense? Is the model applicable to erosional margins? Or the procedure used to build a model? Adding more references is also important.

iii) are there specific problems encountered in pervious FWI/imaging works apart of scaling issues? For example, as seen in Park et al (2010) and addressed in Kamei et al. (2012), low velocity zones were problematic for MVA and subsequent earthquake fault imaging was really a problem (perhaps blank accretionary prisms) – the authors rightly mention "trapped" waves etc. Adding imaging/inversion issues for (specific) important geological features will be helpful (and if they are incorporated into).

Interactive comment

"deep" targets: what do you mean by deep targets? Perhaps you can be more specific?

iv) waveform modeling Great to see a range of different modeling efforts. Some motivational statements will be helpful: Why do these modeling important? Are you recommending to generate 3D (visco-)elastic spectral-element waveforms and apply a method of imaging/inversion? Are you going to make these waveforms available as "datasets" as done by BP/Chevron etc?

Interwoven OBS gathers are nice, but some of the authors descriptions are difficult to follow (esp. 2D vs 2.5D vs 3D) unless scrutinizing those plots. The authors should add arrows (e.g. Pn waves or representative off-planer waves). Also it would be easier to understand "complexity" if the authors show 2.5D snapshots along with 3D snapshots. Please add amplitude spectrum and amplitude-vs-offset curves to show the spectra esp. for pure vs visco acoustic simulations to quantitively display the discrepancies.

Please add comments on whether/how much the modeled waveforms represent the observed waveforms (e.g. in eastern Nankai) to convince the model is representative.

A word for choosing spectral element at the start of section 3.3 will be beneficial rather than at the end.

v) imaging The authors discuss about benefits to FWI/tomography/acquisition. How does the model help imaging? How the model help bridging imaging and tomography gaps?

vi) small scale perturbations "disk-shaped structural elements": what do these who geologically? What do they need to overlap?

Additional comments: Figure 1: Is the figure necessary? I do not know if any outside FWI community understands the figure without further expanding the descriptions. The manuscript is about model not FWI. I think the figure is unnecessary.

Figure 2: Add meanings of the lines in Figure 2a in the caption.

Figure 5: Perhaps add a vertical profile?

Figure 6: c-f: what are numbers on the top left? "Red/blue colours indicate. . ." is difficult to follow.

RMS: is not defined.